REMARKS

Claims 1 and 4-17 are all the claims pending in the application.

Independent Claims 1, 9 and 13 are amended to recite that the lubricant contains "0.001 to 3 wt% of particles comprising an inorganic compound having an average particle size of 2 μm or smaller". Such element is described in Claim 11 as originally filed. See also [113] - substitute specification. No new matter has been added.

Entry of the amendment is respectfully requested along with reconsideration and review of the claims on the merits.

Request for Continued Examination

Applicants appreciate that the Examiner has withdrawn the finality of the previous Office action pursuant to 37 C.F.R. § 1.114, and appreciate the Examiner's indication that Applicants' submission filed on August 27, 2003 has been entered.

Claim Rejections - 35 U.S.C. § 103

Claims 1 and 4-17 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Naka et al (U.S. Patent 5,728,659) in view of Heimann et al. (U.S. Patent 6,010,984).

The Examiner cited Naka et al. as teaching a grease composition for a rolling bearing comprising 10 to 60 parts by weight of a mixture of diurea compounds as a thickener based on 100 parts by weight of a base oil; as teaching that the base oil used in the grease is not particularly limited; as teaching the use of base oils having a kinematic viscosity of preferably 40

to 400 mm^2/s; as teaching that the grease composition may optionally contain publicly known additives (column 7, lines 31-33); and as teaching that the amount of the additives is not particularly limited, but usually not more than 20% by weight of the grease composition.

The Examiner acknowledged that Naka et al fails to teach the addition of a pH adjustor. However, the Examiner cited Heimann et al. as teaching lubricant and grease compositions which impart corrosion and microbial resistance, and a high dropping point; as teaching that the pH of the grease can be tailored to be compatible with the metal surface which is contacted with the grease or gel; as teaching that the grease will typically have a pH that ranges from about 7 to about 14; and as teaching the addition of conventional additives.

The reason for rejection was that it would have been obvious to add a pH adjustor to the grease composition of Naka et al. in order to adjust the pH to "about 7 to about 14" and tailor thereby the grease to be compatible with the metal surface which is contacted with the grease, with a reasonable expectation of enhancing its corrosion resistance.

Applicants respond as follows.

As described above, independent Claims 1, 9 and 13 are amended to recite that the lubricant contains "0.001 to 3 wt% of particles comprising an inorganic compound having an average particle size of 2 μm or smaller", concurrently with maintaining the pH in a range of from 5 to 13 or 7 to 13.

None of Naka and Heimann teaches or suggests a lubricant composition employing the combination of a pH of 7 to 13 or 5 to 13 and a specific quantity of particles having a specific average particle size as required by the amended claims.

In the present invention, Applicants describe starting at page 13, second full paragraph, the many benefits of this specific combination. Namely, Applicants discovered that a sufficiently strong oily film can be formed between the rolling surface and the raceway surface by incorporating fine particles of an inorganic compound having an average particle size of 2 μm or smaller into the lubricant and by adjusting the pH to 5 or higher, whereby metal-to-metal contact can be prevented to improve the bearing life L under high temperature and high speed conditions.

As described at page 37, first full paragraph, the particles comprising an inorganic compound having an average particle size of 2 μm or smaller are incorporated into the lubricant in an amount of 0.001 to 3 wt% to improve oily film formation between the rolling surface and the raceway surface thereby to reduce the tangential force between the rolling surface and the raceway surface. Reduction in tangential force suppresses formation of small crevices to bring about improved durability of the rolling bearing.

Bridging pages 37-38, Applicants describe that where an oily film is formed and maintained sufficiently between the rolling surface and the raceway surface, it acts like a buffer producing a damping effect to lower the vibration level of resonance, etc., and the maximum load imposed on the rolling elements. Enhancement of such a damping effect of the lubricant

decreases the tangential force between the rolling surface and the raceway surface thereby suppressing formation of small crevices.

Starting at page 38, second full paragraph, and ending on page 40, Applicants describe the composition of particles comprising the inorganic compound, including the necessary specific particle size range and the necessary specific amount of particles. The particles comprising an inorganic compound are uniformly dispersed in the lubricant. Even where the oily film receives a great shearing stress of high-speed rotation or becomes thinner due to rotation in high temperature, the particles present in the oily film serve to keep the oily film firm on the contact surface between the rolling surface and the raceway surface. Thus, metal-to-metal contact is avoided to improve the seizure life of the bearing. Furthermore, the particles comprising an inorganic compound enter the inside of a fibrous thickener to reinforce the gel structure.

However, as described bridging pages 40-41 of the specification, addition of the subject particles is not enough. That is, with water in the lubricant, a fresh small crevice is formed by tensile stress. A hydrogen evolution type corrosion reaction is then considered to take place near the inlet of the crevice immediately after crevice formation. If the hydrogen ion concentration of the lubricant is high, that is, if the pH is low, the rate of production of corrosion products becomes high such that a strong reaction film is not sufficiently formed in the crevice. This results in a failure to suppress hydrogen absorption inside the bearing material. The lower pH limit for assuring sufficient bearing reliability is set at 5. On the other hand, if water seeps into

the lubricant to increase pH over 13, there is a possibility that the base oil undergoes deterioration by hydrolysis. Accordingly, the upper pH limit is set to 13.

Thus, it is the combination of pH and the presence of particles of a specific size and quantity which provides the above-noted effects of the invention.

Although Naka and Heimann each may generally disclose additives in their compositions, and a pH overlapping the scope of the present claims, Applicants submit that these references, individually or in combination thereof, fail to disclose or teach a lubricant composition specifically comprising "0.001 to 3 wt% of particles comprising an inorganic compound having an average particle size of 2 μm or smaller", or teach the particular benefits of adding such particles to a lubricant in a rolling bearing while also maintaining the pH at from 5 to 13 or 7 to 13.

For the foregoing reasons, it is respectfully that the claims as amended are patentable over Naka and Heimann, and withdrawal of the foregoing rejection under 35 U.S.C. § 103(a) is respectfully requested.

CLAIM REJECTION - 35 U.S.C. § 112, SECOND PARAGRAPH

Claim 6 was rejected under 35 U.S.C. § 112, second paragraph, as being indefinite with respect to the expression "or a derivative thereof."

In response, claim 6 has been amended to delete "or a derivative thereof", and withdrawal of the foregoing rejection under 35 U.S.C. § 112, second paragraph, is respectfully requested.

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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